

**WHAT IS CLAIMED IS:**

1. An E-PON (Ethernet Passive Optical Network) comprising:  
an OLT (Optical Line Terminal); and  
a plurality of ONUs (Optical Network Units) connected to the OLT,  
5       said OLT including means for assigning bandwidth to the plural ONUs utilizing  
one or more logical DBACNs (Dynamic Bandwidth Allocation Control Nodes) for  
collecting bandwidth request information from the ONUs and, in a priority order of the  
ONUs, allocating a smaller one of a total requested bandwidth and a total available  
allocation-bandwidth to said plurality of ONUs.  
10
2. The E-PON of claim 1, wherein said allocating comprises the intermediate  
step of allocating at least part of said smaller one to at least one of said DBACNs.
3. The E-PON of claim 1, wherein said allocating is performed in accordance  
15       with a tree structure wherein the plural ONUs and the one or more DBACNs are nodes  
of a tree.
4. The E-PON of claim 1, wherein, in performing said allocating, at least some  
of the DBACNs select from among at least two elements respectively pre-selected from  
20       the group that includes the plural ONUs and one or more DBACNs.

5. The E-PON of claim 4, wherein the selecting by said at least some of the DBACNs entails switching periodically among the pre-selected elements, and wherein a time rate of the switching varies with a hierarchical stage in said tree of the selecting DBACN.

5

6. The E-PON of claim 4, wherein, in performing said allocating, each of the DBACNs selects from among at least two elements respectively pre-selected from the group that includes the plural ONUs and one or more DBACNs

10

7. The E-PON of claim 1, wherein the assigning means includes a processor and a computer-readable medium for storing a computer program which, when executed by the processor, executes said collecting and said allocating.

8. The E-PON of claim 7, wherein said allocating comprises the intermediate step of allocating at least part of said smaller one to at least one of said DBACNs.

15

9. The E-PON of claim 7, wherein the allocating is performed in accordance with a tree structure wherein the plural ONUs and the one or more DBACNs are nodes of a tree.

20

10. The E-PON of claim 7, wherein, in performing said allocating, at least some of the DBACNs select from among at least two elements respectively pre-selected from the group that includes the plural ONUs and one or more DBACNs.

11. The E-PON of claim 10, wherein the selecting by said at least some of the DBACNs entails switching periodically among the pre-selected elements, and wherein a time rate of the switching varies with a hierarchical stage in said tree of the selecting DBACN.

5

12. The E-PON of claim 10, wherein, in performing said allocating, each of the DBACNs selects from among at least two elements respectively pre-selected from the group that includes the plural ONUs and one or more DBACNs

13. The E-PON as set forth in claim 1, wherein each of at least some of said one or more DBACNs sequentially select one of the plural ONUs at a time, and preferentially allocates a bandwidth to the selected one.

10

14. The E-PON as set forth in claim 13, wherein said one or more DBACNs each sequentially select one of the plural ONUs at a time, and preferentially allocates a bandwidth to the selected one.

15. The E-PON as set forth in claim 1, wherein the DBACNs and ONUs are arranged in hierarchical stages of a tree, with the ONUs being positioned in a lowermost stage thereof, and DBACNs or ONUs positioned in an intermediate stage are connected to a DBACN positioned in a stage higher than that intermediate stage;

wherein the DBACN positioned in the uppermost stage allocates a smaller one of a total available allocation-bandwidth and a total requested bandwidth, obtained by

collecting bandwidth request information inputted from DBACNs connected thereto from a lower stage, to said DBACNs connected thereto from a lower stage in a priority order of said DBACNs connected thereto from a lower stage; and

wherein the DBACNs positioned in stages other than the uppermost stage each  
5 collect bandwidth request information inputted from DBACNs or ONUs connected thereto from a lower stage, and output the collected information to a DBACN connected thereto from a higher stage, and further allocate a bandwidth allocated by said DBACN connected thereto from a higher stage to said DBACNs or ONUs connected thereto from a lower stage in a priority order of said DBACNs or ONUs  
10 connected thereto from a lower stage.

16. The E-PON as set forth in claim 15, wherein the DBACNs each sequentially select one of DBACNs or ONUs connected thereto from a lower stage at a time, and preferentially allocate a bandwidth to the selected one.

17. The E-PON as set forth in claim 16, wherein the DBACNs are each  
15 connected, from an immediately higher stage, to two of the one or more DBACNs and plural ONUs.

18. A DBA (Dynamic Bandwidth Allocation) method employing a tree algorithm in an E-PON including an OLT and a plurality of ONUs connected to the OLT, the DBA method being based on steps comprising:

- a) arranging a plurality of logical DBA Control Nodes (DBACNs) in hierarchical stages of a tree with the ONUs being positioned in a lowermost stage thereof, and connecting DBACNs or ONUs positioned in an intermediate stage to a DBACN positioned in a stage higher than that intermediate stage;
- b) sequentially performing a process of causing a DBACN to collect bandwidth request information inputted from DBACNs or ONUs connected thereto from a lower stage, starting from a lowermost DBACN up to an uppermost DBACN in the hierarchy;
- c) causing the uppermost DBACN to allocate a smaller one of a total available allocation-bandwidth and a total requested bandwidth to DBACNs connected thereto from a lower stage in a priority order of said DBACNs connected thereto from a lower stage; and
- d) causing DBACNs positioned in stages below that of the uppermost DBACN to each allocate a bandwidth allocated by a DBACN connected thereto from a higher stage to DBACNs or ONUs connected thereto from a lower stage in a priority order of said DBACNs or ONUs connected thereto from a lower stage.

19. The DBA method as set forth in claim 18, wherein, during the steps c) and d), the DBACNs each select one of DBACNs or ONUs connected thereto from a lower stage at a time, and preferentially allocate bandwidth to the selected one.

20. The DBA method as set forth in claim 18, wherein, at step a), the DBACNs are each connected, from an immediately higher stage, to two of the plural DBACNs and ONUs.